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PREVALENCE OF URINARY SCHISTOSOMIASIS ANDRELATED UNDER-NUTRITION AMONG PRIMARY SCHOOL CHILDREN AT ABOBO DISTRICT, GAMBELLA, SOUTHWEST ETHIOPIA

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A THESIS SUBMITTED TO THE SCHOOL OF BIOMEDICAL AND LABORATORY SCIENCES, COLLEGE OF MEDICINE AND HEALTH SCIENCES, UNIVERSITY OF GONDAR, FOR PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN INFECTIOUS AND TROPICAL DISEASES.

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CERTIFICATE

This is to certify that the thesis entitled "**Prevalence of Urinary Schistosomiasis and Related Under-nutrition Among Primary School Children at Abobo District, Gambella, Southwest Ethiopia**" submitted byShashie Geleta for the award of MSc. Degree in Infectious and Tropical Diseases was carried out under our supervision and the thesis has not been previously submitted in part or full for any degree or diploma of this or any other University.

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DECLARATION

The research work in this thesis entitled "**Prevalence of Urinary Schistosomiasis and Related Under-nutrition Among Primary School Children at Abobo District, Gambella, Southwest Ethiopia**"was carried out by me under the supervision of Mr. AgersewAlemu, Mr. SisayGetie and Prof. BerhanuErkoin the College of Medicine and Health Sciences, School of Biomedical and Laboratory SciencesUniversity of Gondar, for the award of MSc Degree inInfectious and Tropical Diseases. I declare that this work is original and has not been submitted to any other University or institution.

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LIST OF ACRONYMS

BMI:	Body Mass Index
HAZ:	Height-for-age Z-scores
NCHS:	National Center for Health Statistics
NGO:	Non-Governmental Organization
WHO:	World Health Organization

ABSTRACT

Introduction: Urinary schistosomiasis affects large number of people worldwide, with wide spread in Africa and children as the most vulnerable group. Chronic existence of this infection can lead to imbalance of nutritional status and growth retardation among children. Even though, the disease is endemic in Ethiopia, there is scarcity of informationdealing with prevalence of this disease and under-nutrition among individuals with this disease.

Objective: To assess the prevalence of urinary schistosomiasis and related under-nutrition among primary school children at Abobo district, Gambella, Southwest Ethiopia.

Methods: Cross-sectional study was conducted from February to June 2014 among primary school children in Abobo district. A total of 304 study participants were selected by simple random sampling. Structured questioner and anthropometric measurements were used to collect demographic and associated factors, and under-nutrition data, respectively. Urine samples were examined by filtration techniquefor urinary schistosomiasis and egg load was determined per 10ml urine. Data was entered and analyzed using SPSS version 20. Both bivariate and multivariate binarylogistic regression was used. AOR with 95% CI were used to measure the strength of association between independent and outcome variable. P-value < 0.05 was considered as statistically significant.

Results: Among 304 study participant the overall prevalence of urinary schistosomiasis was 109(35.9%) with mean egg intensity of 8.76 per 10ml of urine. Males(67(61.5%)) were significantly[AOR(95%CI)= 2.15(1.31,3.52)] more affected than females (42(38.5%)). The prevalence of the infection increased with age but without significant association between them. Children whose fathers are farmer were significantly [AOR (95%CI) = 1.96(1.19, 3.22)] more affected (61(56%)) than others. The prevalence of under-nutrition among urinary schistosomiasis infected were 6(5.5%), 1(0.9%) and 4(3.7%) for stunting, underweight and thinness respectively and they had no significant association with the infection.

Conclusion: Urinary schistosomiasis was endemic at the study area, where sex, father's occupation and living with parent were the determinant factors of the infection. There was no significant association between urinary schistosomiasis and under-nutrition.Regular health education and mass treatment isrecommended at the site.

Key words: *Urinary schistosomiasis, Under-nutrition, School children, Gambella.*

1. INTRODUCTION

Schistosomiasis is a chronic disease of human caused by blood fluke parasite called *Schistosoma*. *Schistosomahaematobium (S. haematobium), S. mansoni, S. japonicum, S. mekongi and S. intercalatum* are among the different species of *Schistosoma*(1).This infectious disease affects more than 230 million people worldwide(2).In 2004 the annual global estimated death due to schistosomiasis was 41,000 (3). Schistosomiasis is considered as the second public health problem of human next to malaria (4). Health problems associated with schistosomiasis include sever organ pathology, anemia, malnutrition, stunted growth, impaired cognitive development and reduced capacity to work (5).

Of the world's estimated cases of schistosomiasis, 93% occur in sub Saharan Africa countries where it ranked second next to malaria in causing severe morbidity (6). Among *Schistosoma* species, *S.haematobium* is the cause for urinary schistosomiasis and most prevalent in Africa (3). According to World Health Organization (WHO) 2006 report, of the estimated 200 million cases of urinary schistosomiasis, 90% of them were in sub-Saharan Africa (6). The annual case fatality rates due to *S. haematobium* were assumed to be 0.02% (3).

Urinary schistosomiasis is associated with health problems such as haematuria, dysuria,nutritional deficiencies, lesions of thebladder, kidney failure, an elevated risk ofbladder cancer and in children growthretardation (7). In sub-Saharan Africa; 70, 32, 18 and 10 million individuals experience heamaturia, dysuria, bladder-wall pathology and major hydronephrosisrespectively associated with *S. haematobium*. The estimated mortality rate due to kidney problems was 150,000 per year (8).

Both *S.haematobium and S.mansoni*are also endemic in Ethiopia where about 4million people are estimated to be infected and 30-35 million people are at risk of infection (9, 10). *Schistosomahaematobium*with focal distribution in the country is endemic in lowland areas like; Awash Valley, Kurmuk, and flood plains of WabiShebele(9).

The transmission of schistosomiasis is dependent on specific snail hosts and human activities leading to contamination of water; therefore its distribution is focal (5). The risk and reemergence of schistosomiasis is attributed by the range of snail habitat promoted by dam construction (11).

In children,*S. haematobium*infection causes nutritional deficiencies, growthretardation (12)and adverse effects on cognitive development (13).This is because schistosomiasis may reduce both protein-energy and iron status and can thereby decrease physical activity, physical fitness, cognitive and school performance, and work capacity and productivity by the mechanisms that chronic urinary blood loss leads to exhaustion of iron stores(12).

Frequent water contact behaviours of school age children was suggested to be the major factor that will render them to be more vulnerable to schistosomiasis (14, 15). Presence of different rivers and dam in Gambella paves the way for children to play in water and being exposed to the infection.AlweroRiver is found in Abobodistrict of Gambella. There is a dam constructed at this river (Alwero dam) that is suitable for the reproduction of schistosomiasis transmitting snail. It is very near to the home of the community.

Despite recent efforts to control the disease, schistosomiasis is still one of the causes of mortality and morbidity. Several studies have been conducted on the effect of *S. haematobium*infection on nutrition status of children in different parts of world. For instance, a study conducted on effect of *S. haematobium* infection on the nutritional status of children was shown by comparison of the nutritional status of *S. haematobium* positive children given treatment and without treatment (placebo group) and reexamining their nutritional status provided rapid growth and gaining of weight among those who were provided with treatment(16).

Even though urinary schistosomiasis cases were identified and patients were diagnosed for the disease in the study area, no detailed study wasdone on the prevalence of urinary schistosomiasis and related under-nutrition among school children in Abobo district Gambella. Therefore, this study wasaimed to determine the prevalence of *S. haematobium*infection and relatedunder-nutritionamong primary school children at Abobo district, Gambella, Southwest Ethiopia.

2. LITERATURE REVIEW

2.1 Prevalence of urinary schistosomiasis and associated factors

Urinary schistosomiasis was endemic in Middle East and African countries(17). Study conducted in Yemen showed prevalence of 23.8% with an intensity of 22.1% heavy infection and 77.9% light infection and the prevalence was significantly high among males than females (18).

The highest burden of schistosomiasis exists in Africa. The mean prevalence of *S. haematobium* in 43 sub-Saharan African countries was 22.4% (19). Different studies have suggested that school aged children are the most affected age group (14, 15, 20). A urinary schistosomiasis study conducted among school children in Okija, Anambra State, South-Eastern Nigeria shown a total prevalence of 24%, of which 52% was among 8 to13year aged children. Children coming from farmer parents had more infection, 12.7% than the combined children coming from traders and public servants, 11.3%(21). On the other hand, a comparative study conducted among primary school children and farmers in Nigeria; Obollo-Eke, Enugu State showed a prevalence of 18% and 16.9%, respectively (22).

Epidemiological survey on urinary schistosomiasis among school children in West Nile areas in Khartoum showed a total prevalence of 16%. Males were five times more affected than females and children in the age between 11-13 year were most affected (23). Urinary schistosomiasis epidemiology study in Zanzibar found an overall prevalence of 50.6%; in the same way boys were more infected than girls and proximity of the child's home to a site containing *S. haematobium* infected snail was a predictor for urinary schistosomiasis(24).A parasitological survey of *S.haematobium* infection among primary school children in the remote areas of Hhohho and Manzini Provinces in Northwestern Swaziland was undertaken and a total prevalence of 5.3%. In this study, the prevalence was high among boys (25).

On the contrast, a study conducted in selected rural communities of Osun State, Nigeria, revealed higher prevalence of urinary schistosomiasis among females (31%) than males (28.1%).The prevalence of urinary schistosomiasis infection among thesechildren was 29.6%.Heavy and light infections were seen in 40.9% and 59.1% of them respectively(26). In Ghana with overall prevalence of 34.4% also showed higher prevalence among females (35.8%) than males (32.3%). Parental occupation had significant association with the infection(27).

A study on the prevalence and intensity of urinary schistosomiasis conducted in Senegal recorded a prevalence of 57.6% and egg count intensity of 185eggs/10ml of urine. Heavy infection was reported from 72.8% of the urine samples(28).

A cross-sectional study conducted among primary school students in a war zone, Southern Kordofan State of Sudan showed that the prevalence of *S. haematobium* was 23.7%. The overall intensity of infection among the infected students was 14.9 eggs/10 ml urine but there was no correlation between intensity of infectionand age (r = 0.028 and p value = 0.52). The prevalence was high among males and inversely proportional to age but the prevalence of *S. haematobium*infection was not associated with the age of students. Parent's illiteracy and work as a farmer were associated with the infection. In addition, infection was higher among students who had frequent contact with open water sources. However, the presence of health advocacy groups at school was associated with less infection among students (p <0.001) (29).

A prevalence of 41.5% was recorded in an epidemiological study of urinary schistosomiasis in two local government areas of Benue state, Nigeria. The infection had the highest prevalence (47.0%) among children whose parents had no formal education while it had 44.0% of prevalence among children whose parents were farmers (30).In a study conducted to identify associated factors for urinary schistosomiasis in Nigeria; not living with biological parents, living close to the local river and parents' educational status had significant association with the infection(31).

Likewise, the prevalence of urinary schistosomiasis varies among different areas of Ethiopia. On a community based and treatment efficacy study conducted in Dulshatalo village, Western Ethiopia, 57.8% of *S. haematobium* prevalence was recorded. The mean egg count was 15.32 and presence of *S. haematobium* eggs was significantly associated with age(32).A cross-sectional study using sedimentation technique at Somali Region; the prevalence was 16.0%. In this study age had no significant association with infection but sex had significant association where males were more likely to be infected with the infection than females(33).In a cross-sectional study conducted in Afar region the prevalence of *S.haematobium* at Hassoba and HassobaBuri village was found to be 24.54% (34). Another study conducted in Afar recorded a prevalence of 47.6% by the use of filtration methodand the mean egg count was 14.8 per 10ml of urine (35).The prevalence of the infection in the middle Awash

Valley by the use of reagent sticks and urine filtration was determined as 19.5% and 3.1% respectively (36).

2.2 Urinary schistosomiasis related under-nutrition

Malnutrition is a public health issue among school-aged children in developing countries (37). Infectious diseases are the immediate cause of malnutrition and child death (38). In a study that involves 369 school children among 76 different countries, underweight and thinness were more prominent in South-East Asia and Africa (37).

Study on the impact of urinary schistosomiasis on nutritional status among school children in South-Eastern Nigeria showed that, children with lower body weight were the most infected category with the highest prevalence recorded among those who weighed 19.0-22.0k g (88.8%) while the least prevalence was recorded among those who weighed above 31.0kg with significant difference in trend. There was also a significant association between height of the children and *S. haematobium* infection in which Children of lower height (4.0-5.9m) were significantly more infected (87.2%) with *S. haematobium*(39).

Study conducted on effect of urinary schistosomiasis on nutritional status of children among rural communities of Osun State, Nigeria, showed prevalence of 35.7%, 0.9% and 20% for stunting, wasting and underweight respectively. The association between urinary schistosomiasis and nutritional status was not significant(26). Urinary schistosomiasis study in Ghana also revealed no significant difference in nutritional status among infected and uninfected(27).

Furthermore, comparative studies carried out among children in Eko-Ende Southwest, Nigeria, showed that prevalence of mild, moderate and sever stunting were 13.5%, 14.7%, 48.0%, respectively associated with *S.haematobium*. On the other hand, the prevalence of mild and moderately malnourished (underweight) was 31.8% and 19.4%, respectively among *S.haematobium* infected. While wasting status of children with 78.2%, 20.2% and 1.6% of infected had normal, mild and moderate weight for height score respectively (40).

3. SIGNIFICANCE OF THE STUDY

Public health and economic impact of urinary schistosomiasis remains to be a key challenge to different countries of the world. The frequent and prolongedwater contacts of children makethem to be the most vulnerable and highly risk group. Targeted prevention, control and elimination of the disease begin with the identification of specific sites with its disease burden.

This research finding provides a base line data that help in developing strategies for the prevention and control of urinary schistosomiasis that intern plays a great role in reducing morbidity and mortality related with urinary schistosomiasis andunder nutrition that is related with it. A prevalence study among these groups provides a good indication for intervention activities in the general population (the community).In addition, the outcome of this study provides base line information for national schistosomiasis mapping. Therefore, because there was no detailed study conducted with regard to the prevalence of urinary schistosomiasis and their under-nutritionalstatus in the study area, absence of report related with this condition impress investigation of this study among Abobo district primary school children, Gambella, South West Ethiopia.

4. OBJECTIVE

4.1 General objective

To assess prevalence of urinary schistosomiasis andrelated under-nutritionamong primary school children at Abobo district, Gambella, Southwest Ethiopia.

4.2 Specific objectives

- To determine the prevalence of urinary schistosomiasis among primary school children.
- To determinethe prevalence of under-nutrition among urinary schistosomiasis infected primary school children
- To identify associated factors for urinary schistosomiasis.

5. MATERIALS AND METHODS

5.1 Study area

The study was conducted at Perbongo mender 5/6 and Abobo primary schools of Abobo district, Gambella region, Southwest Ethiopia. Abobo is located 822 Kms Southwest of Addis Ababa and 45 Kms South of Gambella Town (the capital of the region). The district is bordered with Gambella district to the North, Itang special district to the Northwest, Gog district to the South, Jikaw and Jor district to the West, Mengeshi district and Oromia region to the East. It covers a total area of 2437.76 Km^2 and has16 rural Kebeles administration and 1 urban administration. The region has four major rivers: Baro, Gillo, Alwero and Akobo. The people in the region are engaged in agricultural, fishery and other activities. Fish become a staple food and additional income mainly for the Anywa ethnic group. The Alwero dam is formed by damming the Alwero River. It is located at a distance of 6.5km to the West of the Abobo town and it is made for the purpose of irrigation and fishery development. The health institutions in district are three government health centers, one non-governmental health center and sixteen health posts. The district has ten primary schools, three high schools and one preparatory school.

5.2 Study design and study period

A cross-sectional study was carried out from February 2014 to June 2014.

5.3 Population

5.3.1 Source population

The source population for this study was all primary school children in Abobo district.

5.3.2 Study population

The study population was all school children who are attending Perbongo mender 5/6 and Abobo primary schools during the study period.

5.4 Inclusion and exclusion criteria

5.4.1 Inclusion criteria

Primary school children with an age of 7-14 years atPerbongo mender 5/6 and Abobo primary schools were included.

5.4.2 Exclusion criteria

All students who started medication for schistosomiasis two weeks before data collection and at the time of data collection and those students who were seriously ill during data collection were excluded.

5.5 Operational definition

- Primary school children: children within age group of 7-14 (41).
- Positive urinary schistosomiasis: urine sample with ova of *Schistosomahaematobium*
- Negative urinary schistosomiasis: urine sample without ova of *Schistosomahaematobium*
- Under-nutrition: stunting, underweight and thinness of children.
- Stunting: Height-for-age below -2 standard deviation (SD) of the WHO Child Growth Standards median.
- Underweight: weight-for-age below -2 standard deviation (SD) of the WHO Child Growth Standards median.
- Thinness: Body Mass Index for age below -2 standard deviation (SD) of the WHO Child Growth Standards median.

5.6 Variables of the study

5.6.1 Dependent variables

- Urinary schistosomiasis
- Under-nutrition

5.6.2 Independent variables

Socio-demographic: Age, sex, educational level, address, educational status of parents, occupation of parents.

Other factors: Source of water for washing and bathing, swimming habit, Latrine usage, living with biological parent, distance between dam and home, presence of regular health education and knowledge about urinary schistosomiasis.

5.7 Sample size and sampling technique

Sample size

The required sample size was determined using single population proportion formula and considering the following assumptions:

- p= 24.54 % (proportion that was taken from urinary schistosomiasis prevalence in Afar (34))
- Level of significance to be 5% (α = 0.05), and
- Critical value at 95% confidence interval, Z α/2 = 1.96
- Absolute precision or margin of error to be 5% (D = 0.05).

The formula for calculating the sample size is:

$$n = \frac{(z\alpha/2)^2 P(1-P)}{d2}$$

$$= \frac{(1.96)^2 * 0.2454(1-0.2454)}{(0.05)^2}$$

$$=285$$

With the addition of 10% non-response rate, the total sample was 313.

Sampling technique

Perbongo mender 5/6 and Abobo primary schools were selected randomly from ten primary schools in Abobodistrict. Simple random sampling technique was used to draw the sample school children by using their registration book as a frame. The sample size was proportionally allocated to each school and each class of the schools. Proportional allocation = ni = $\frac{n}{N}$Ni

Therefore, 213 and 91 study participants were selected from Perbongo mender 5/6 and Abobo primary schools respectively.

5.8 Data collection and laboratory method

5.8.1 Questionnaires

Structured questionnaire prepared in English and then translated into Agnua and then back to English was used to collect demographic data and associated factor for urinary schistosomiasis.

5.8.2 Assessment of under-nutrition

Two health extension workers were trained on the appropriate taking of anthropometric measurements of the study participants. The basic anthropometric measurements; age, height and weight were taken**.** Body weight was determined to the nearest 0.1 kg using electronic digital scale and height wasmeasured to the nearest 0.1 cm on stadiometer. Height-for-age Z-scores (HAZ), weight-for-age Z-scores (WAZ)

and Body Mass Index for age (BMIA)wascomputed from the National Center for Health Statistics (NCHS) of WHO 2007 reference values using Anthroplus version 1.0.3 and Epi-Info version 3.5.1softwares(42).

5.8.3 Urine sample collection and examination

Urine samples collection:

Two individuals were trained on the collection appropriate urine sample with required quantity at the appropriate time. The study participants were asked to provide urine sample. Fifteen (15) ml of terminal urine samplewas collected from each study participant in clean labeled containers that was coded with label similar to questionnaires' code number. Then, 0.2ml of 37% formalin was added to the 15ml of urine as a preservative. The sample was collected between 10 Am and 2 Pm, which is appropriate time to get high egg load(43).

Microscopic diagnosis of *Schistosomahaematobium*:

A standard filtration technique was used to identify and quantify *S. haematobium* ova. After mixing, 10ml of urine sample was forced to pass through 13mm diameter and 12µm pore size of nylon mesh filter(Costar Corporation, USA) on its supporter using plastic syringe. The filter on which the residues including *S. haematobium*eggs were found was removed with forcepsand placed on a clean glass microscope slide and examined under a 10x objective lens of a microscope for eggs.Urine samples containing egg of *S. haematobium*with terminal spine were recorded as positive, while absence of egg was considered as negative. For positive samples,eggswere counted and recorded as number of eggs per 10ml of urine. Any sample which contain less than 50 ova/10ml was considered as a light infection; whereas equal to or more than 50 ova/10ml, was considered as heavy infection, according to WHO guidelines (43).

5.9 Quality control

All instruments and reagents wereused as per manufacturer's instructions. Ten percent (10%) of the urine samples were re-checked by another experienced laboratory technologist. Data was collected by trained persons and its completeness was checked by the investigator**.** Then it was entered in to electronic data base and any error appeared during entry wasre-checked to the original hard copy.

5.10 Data processing and analysis

The collected data was coded and entered into SPSS version 20 for analysis. Data summary was made using descriptive statistics. Both bivariate and multivariable logistic regressionswere used to assess the association between dependent and independent variables. Variables with p-value < 0.05 were considered as statistically significant. For anthropometric data, a software package based on the National Center for Health Statistics (NCHS) database provided with Anthroplus version 1.0.3 and Epi-Info version 3.5.1 software was used. Final result was presented in table, chart or graph.

5.12 Ethical consideration

The protocol of the study was reviewed and approved by Ethical Committee of School of Biomedical and Laboratory Sciences, College of Medicine and Health sciences, University of Gondar. Permission to do the study was obtained from Gambella Regional Health Bureau and Gambella Regional Educational Bureau after explaining the risk and advantage of the study. Then, acceptance letter was submitted to Abobo Health Office and Abobo Education Office. Later, both acceptance and supportive letter was submitted to Perbongo mender 5/6 and Abobo Primary Schools. The oral assent of children and consent of family or guardianwas obtained and all the information obtained from study participants was kept confidential. Children who were positive for *S.haematobium*were sent to Abobo health center for appropriate treatment.

6. RESULT

6.1 Socio-demographic characteristics of study participant

A total of 313 primary school children were recruited and 304 were participated in the study of which 51% of them were males. Forty five point four (45.4%)of them were within the age group between 13 and 14 years with a mean age (±SD) of 11.37 (±2.32). Children from grade 5 to 8 accounted for 56.9% of the total study participant. The major parent's occupation was farmer (51.8%) and house wives (64.4%) for fathers and mothers, respectively. In terms of parents' educational status, 58.9% of fathers and 47.6% of motherswere able to read and write (Table 1).

Table 1: Socio-demographic characteristics of study participants, Abobo District, 2014.

Variables	Frequency	%
Age		
7-9	67	22.0
10-12	99	32.6
13-14	138	45.4
Sex		
Male	155	51
Female	149	49
Educational level		
1-4	131	43.1
5-8	173	56.9
Fathers' occupation		
Farmer	145	47.7
Non farmer	159	52.3
Mothers' occupation		
House wife	190	64.4
Government employee	28	9.5
Daily laborer	30	10.2
Other	47	15.9
Fathers' educational status		
Doesn't read and write	42	15
Able to read and write	165	58.9
Secondary school completed	54	19.3
Expert level	19	6.8
Mothers' educational status		
Doesn't read and write	133	45.2
Able to read and write	140	47.6
Secondary school completed	21	7.1
Total	**304**	**100%**

6.2 Frequency of factors associated with urinary schistosomiasis

Ninety percent (90%) of the study participants responded that they had a habit of swimming in Alwero dam. However, only 21.7% of them experience regular swimming. Among the study participants, 70.1% of them require less than 30minutes to reach the dam and 95.4% of them use it for washing cloths and bathing. With respect to the knowledge about urinary schistosomiasis, 55.3% of the study participants heard about it and school was the information source for 44.2%of them. Majority of the school children (70.9%) of them responded that, bloody urine is the sign of urinary schistosomiasis, and 84.9% and 69.8% of them responded as it istreatable and preventable respectively (Table 2). Most of the children (54.1%) responded swimming in stagnant water will lead to acquiring of urinary schistosomiasis and 15% of the children belief that drinking dirty water will lead to urinary schistosomiasis (Figure 1).

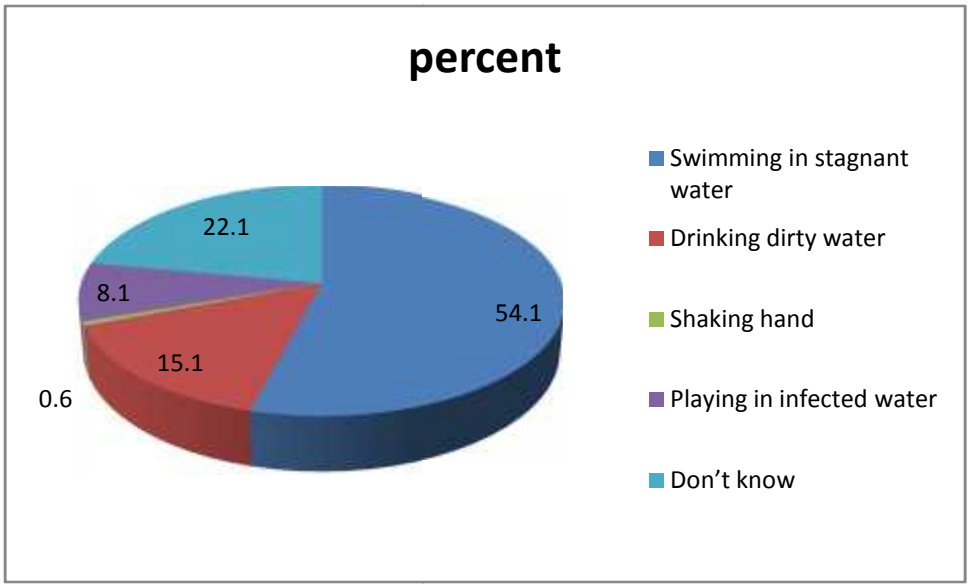

Figure 1:Study participant's response to the possible ways of acquiring urinary schistosomiasis, Abobo district, 2014.

The proportion of children who chosen treatment, avoiding playing and swimming in stagnant water, use of appropriate toilet and drinking clean as means of prevention and control were 37.8%, 16.9%, 1.7% and 5.8% respectively. However, 37.8% of them didn't know any ways of prevention and control.

Table 2: Frequency of risk factors associated with urinary schistosomiasis, Abobo district, 2014.

Variables	No.	%
Latrine use		
Yes	265	87.2
No	39	12.8
Swimming habit		
Yes	274	90.1
No	30	9.9
Swimming regularity		
Some times	214	78.1
Regularly	60	21.9
Living with parent		
Yes	284	94
no	18	6
Distance from river		
<30min	213	70.1
>=30min	91	29.9
Washing and bathing		
Alwero Dam	289	95.4
Other	14	4.6
Heard about urinary schistosomiasis		
Yes	172	56.6
No	132	43.4
Information source		
School	76	44.2
Home	46	26.7
Other	50	29.1
Sign and symptom of urinary schistosomiasis		
Abdominal pain	17	9.9
Dysuria	5	2.9
Bloody urine	122	70.9
Weakness	4	2.3
Don’t know	24	14.0
Parasite penetrate skin		
Yes	49	28.5
no	123	71.5
Know the vector		
Yes	30	17.4
no	142	82.6
Have prevention		
Yes	120	69.8
No	25	14.5
Don’t know	27	15.7
Have treatment		
Yes	146	84.9
No	10	5.8
Don’t know	16	9.3

6.3 Prevalence and intensity of urinary schistosomiasis

In this study, the prevalence of urinary schistosomiasis among primary school children was 35.9% (109 out of 304 study participants) with the mean (SD) egg intensity of 8.76 (14.512) per 10ml of urine. Among the infected study participants, 97.2% (106 out of 109) of them were presented with light intensity infection while 2.8% of them were presented with heavy infection.

Sex and age specific prevalence showed highest prevalence among males and age group of 13-14 years, with a prevalence of 67(61.5%) and 54(49.5%) respectively (Figure 1 and 2 respectively).The mean egg count was also higher for males (9.36 per 10ml) than females (7.81per 10ml), and the age group between 10-12 years with the mean egg intensity of 11.18 per 10ml. The prevalence and intensity of egg count among grade 1-4 and 5-8 students were, 43.1% and 56.9%, and 9.57 per 10mland 8.15 per 10mlrespectively.

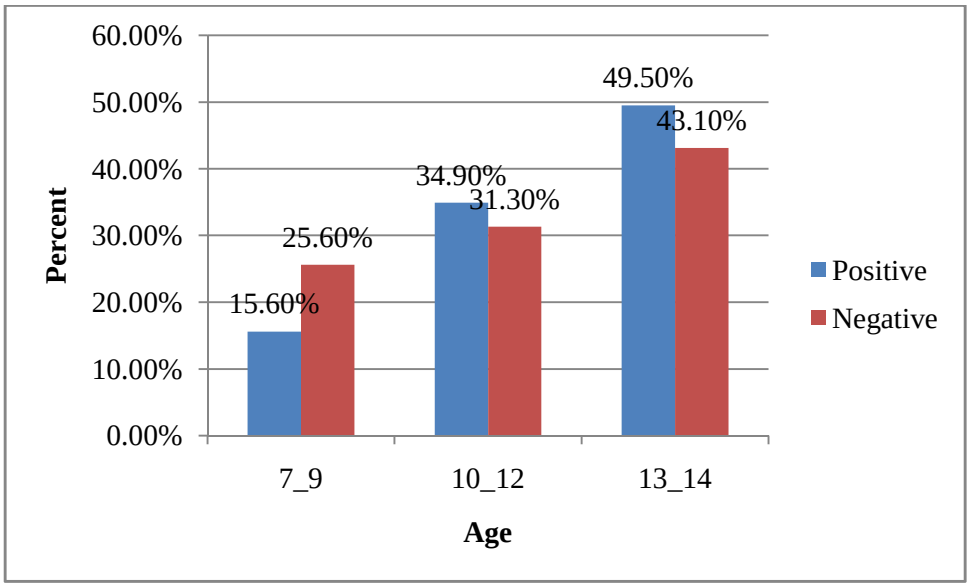

Figure 2: Prevalence of urinary schistosomiasis by age, Abobo, 2014.

Children's of farmer father (61.9%) and house wife mother (64.8%) account the highest prevalence of the infection. Children who have swimming habit had high prevalence (91.7%) than that of with no habit of swimming (8.3%)(Table 4).

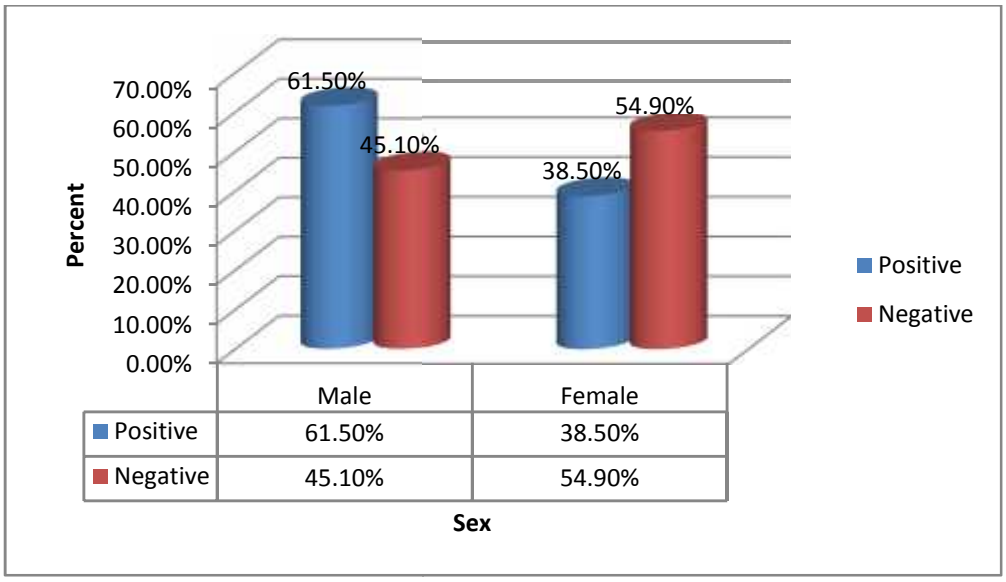

Figure 3: Prevalence of urinary schistosomiasis with respect to sex, Abobo, 2014.

6.3 Prevalence of under-nutrition related with urinary schistosomiasis

The overall prevalence of under-nutrition (either of the three) among study participants presented with urinary schistosomiasis was 9(8.3%) and prevalence of stunting, underweight and thinness was6(5.5%), 1(0.9%), 4(3.7%) respectively(Table 3).

Table 3: Prevalence of under-nutrition among urinary schistosomiasis infected children, Abobo, 2014.

Variable		Under nutrition						
		HAZ		WAZ		BMIA		
		Stunted (%)	Normal (%)	Under weight (%)	Normal (%)	Thinness (%)	Other (%)	Overall Under nutrition (%)
Urinary Schistosomiasis	positive	6 (5.5)	103 (94.5)	1 (0.9)	108 (99.1)	4 (3.7)	105 (96.3)	9(8.3)
	Negative	16 (8.2)	179 (91.8)	7 (3.6)	188 (96.4)	6 (3.1%)	189 (96.9)	21(10.8)
	Total	22 (7.2)	282 (92.8)	8 (2.6)	296 (97.4)	10 (3.3)	294 (96.7)	30(9.9)

Prevalence of stunting and thinness was the same among urinary schistosomiasis infected females and males. However, underweight was higher among infected female (100%)than male(Figure 4).

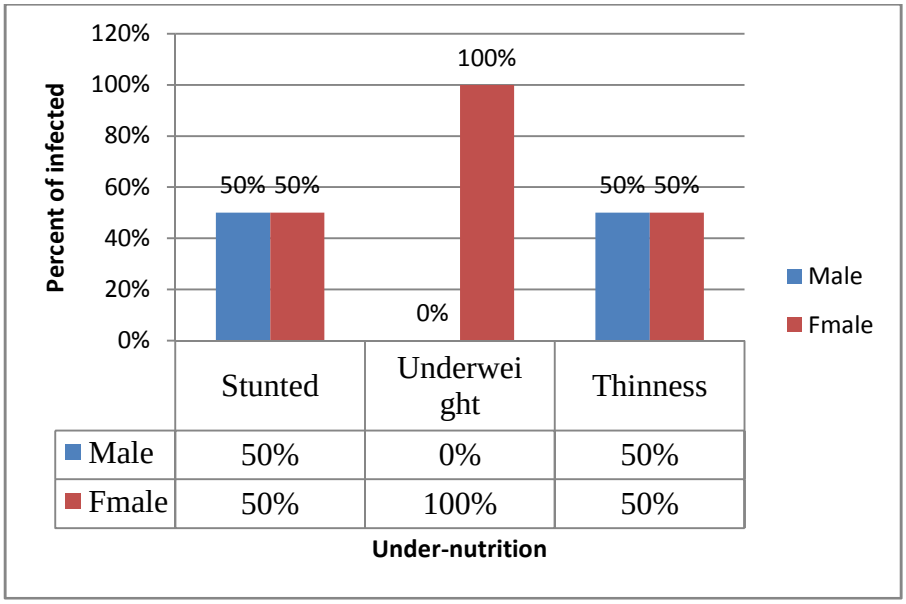

Figure 4: Prevalence of under-nutrition among urinary schistosomiasis infected with respect to sex, Abobo district, 2014.

Under-nutrition with respect to their age showed that, no under-nutrition recorded among 7-9 year age group. Prevalence underweight and thinness was higher among 10-12 year age group (100% and 75% respectively). Age group of 13-14 year had highest prevalence (83.3%) stunting than other age groups (Table 4).

Bivariate logistic regression analysis result between urinary schistosomiasis and HAZ and BMIA was p value >0.2 (0.39, 0.78 respectively). Even though bivariate logistic regression result between urinary schistosomiasis and WAZ was <0.2, adjusting it with other socio-demographic characteristics to multiple logistic regression showed no significance association between them (p>0.05).

Table 4: Under-nutrition among urinary schistosomiasis infected with respect to age, Abobo district, 2014.

Urinaryschistosomiasis Infected		HAZ		WAZ		BMIA	
		Stunted (%)	**Normal (%)**	**Underweight (%)**	**Normal (%)**	**Thinness (%)**	Other **(%)**
Age group							
	7-9	0%	17 (16.5)	0%	17 (15.7)	0%	17 (16.2)
	10-12	1 (16.7)	37 (35.9)	1 (100%)	37 (34.3)	3 (75)	35 (33.3)
	13-14	5 (83.3)	49 (47.6)	0%	54 (50)	1 (25)	53 (50.5)
	Total	6 (100%)	103 (100%)	1 (100%)	108 (100%)	4 (100%)	105 (100%)

6.4 Factors associated with urinary schistosomiasis

The bivariate logistic regression result showed that variables like age, sex, father's occupation, father's educational status, living with parent and source of water for washing and bathing had p value <0.2. However, in the multivariate logistic regression analysis only sex, father's occupation and living with parent had statistically significant association with urinary schistosomiasis. Males were two times more affected than females, 2.13 (95% CI: 1.3, 3.5) (Table 5).The correlation between age of children and egg count showed that, they had weak negative linear relationship (r= -0.007).

Table 5:Bivariate and multivariate analysis of factors associated with urinary schistosomiasis, Abobo district, 2014.

Variables	**Positive** (%)	**COR**(95% CI)	**AOR**(95%CI)
Age			
7-9	17(15.6%)	1	__
10-12	38(34.9%)	1.83(0.93,3.63)	
13-14	54(49.5%)	1.89(1.89,3.61)	
Sex			
Male	67(61.5%)	1.94(1.2,3.12)	2.13(1.3,3.5)
Female	42(38.5%)	1	1
Educational level			
1-4	47(43.1%)	1	__
5-8	62(56.9%)	0.99(0.622,1.6)	
Fathers' occupation			
Farmer	61(56.0%)	1.68(1.05, 2.69)	1.96(1.97,3.22)
Non farmer	48(44.0%)	1	1
Mothers' occupation			
House wife	68(64.8%)	0.98(0.51,1.91)	
Government employee	8(7.6%)	0.71(0.26,1.94)	__
Daily laborer	12(11.4%)	1.18(0.46,3.02)	
Other	17(16.2%)	1	
Fathers' educational status			
Doesn't read and write	13(13.1%)	1.7(0.47,6.06)	
Able to read and write	65(65.7%)	2.44(0.78,7.67)	__
Secondary school completed	17(17.2%)	1.72(0.49,5.98)	
Expert level	4(4.0%)	1	
Mothers' educational status			
Doesn't read and write	53(51.0%)	1.66(0.60,4.54)	__
Able to read and write	45(43.3%)	1.18(0.43,3.26)	
Secondary school completed	6(5.8%)	1	
Swimming habit			
Yes	100(91.7%)	1.34(0.59,3.04)	__
No	9(8.3%)	1	
Swimming regularity			
Some times	79(79%)	1	__
Regularly	21(21%)	0.92(0.51,1.68)	
Living with parent			
Yes	99(90.8%)	1	1
no	10(9.2%)	2.34(0.89,6.12)	3.09(1.14,8.4)
Distance from river			
<30min	74(67.9%)	0.85(0.51,1.42)	__
>=30min	35(32.1%)	1	
Water source for washing			

and bathing			
Dam	101(92.7%)	0.85(0.51,1.41)	__
other	8(7.3%)	1	
Heard about urinary schistosomiasis			
Yes	62(56.9%)	1	__
No	47(43.1%)	0.96(0.59,1.53)	
Parasite penetrate skin			
Yes	18(29.0%)	1	__
no	44(71.0%)	0.96(0.48,1.91)	
Know the vector			
Yes	14(22.6%)	1	__
no	48(77.1%)	0.58(0.26,1.29)	
Have prevention			
Yes	51(82.3%)	1	
No	5(8.1%)	0.34(0.12,0.26)	__
Don’t know	6(9.7%)	0.39(0.14,1.01)	
Have treatment			
Yes	56(90.3%)	1	
No	2(3.2%)	0.40(0.08,1.96)	__
Don’t know	4(6.5%)	0.54(0.16,1.74)	

__ = variables that are not significantly associated in multivariate analysis.

7. DISCUSSION

The overall prevalence of urinary schistosomiasis in this study was 35.9%. According to WHO schistosomiasis infection prevalence category, this prevalence was categorized as moderate prevalence and therefore, it was endemic at this site(44, 45). The prevalence was higher as compared to studies conducted in Afar Region, which revealed 24.54%, the middle Awash Valley(3.1%) and Somali Region (16.0%) (33,34,36). Even it was also higher than studies conducted in African countries like, Sudan (16%)and Swaziland (5.3%)(23, 25). However, it was lower than other study done in Afar Region (47.6 %)and Nigeria (41.5%) (30,35). These differences might be due to difference in ways of life, culture, water-contact patterns, laboratory method usedand proximity to stagnant water.

The intensity of the infection reported in this study (8.76 per 10ml of urine) was lower than intensity in Afar Region (14.8 per 10ml of urine), Senegal (185eggs/10ml of urine) and Sudan (14.9 eggs/10 ml)(28, 29, 35).This could be due to differences in water contact activities.

There was significant association between sex and the infection where males were two times more likely [AOR=2.15; (95%CI:1.313,3.521)] affected than females. This result was similar with other studies conducted Sudan and Swaziland(23, 25, 29). This could be because of socio-cultural factors where males are mostly engaged in water based activities like swimming and bathing, fishing, farming with their father and watering cattle that expose them to acquire the infection. On the contrary of this finding, study conducted in Ghana andNigeria(26, 27) showed higher prevalence among females than males. This could be because there might be cultural difference.

Even though the prevalence of the infection was directly proportional among age group, the association was not significant (p=0.16) and which was similar with study conducted in Somali Regionand Sudan(29, 33). The higher in prevalence among older children might be because of work load difference between them, where older children are more loaded with outdoor activities exposing them to water contact and lead to the risk of the infection, while care might be given for young children.

Occupation of father was significantly associated with the infection in which children whose fatheris farmer were two times more likely affected with the infection than that of non-farmer father [AOR=1.96; (95%CI:1.19,3.22)]. This result agrees with studies done in Sudan, GhanaandNigeria(27, 29, 30). This could be because children might involve in different farming activities like irrigation to help their parent. Although mother's educational status was not significantly associated (p=0.33), the

prevalence of the infection was high among children whose mother can't write and read. This result was similar with study conducted Benue state, Nigeria(30). This could be because of lack of knowledge to teach and advise their children on the prevention of the disease.

Swimming is one reason that leads children to water contact. Even though, the result of this study showed no significant association between swimming habit and urinary schistosomiasis infection, the prevalence of the infection was high among those that have the habit of swimming. That is similar with study conducted in Nigeria(30).It is obvious that these children have more frequent and prolonged water contact that expose them to the infection than that of those who have no the habit of swimming. How often they were swimming had also no significant association with the infection. Children who were swimming sometimes were with higher prevalence than that of regularly swimming children.This might be because children who are swimming sometimes may stay in the water for prolonged time that increases the chance of being penetrated by the snail vector. However, those regularly swimming because they were going regularly they might not stay for long time there, this reduce the chance of acquiring the infection. However, this opposes study conducted in Sudan(29).

Urinary schistosomiasis infection had no significant association with distance between children residence and Alwero dam; that is opposed to study conducted in Zanzibar where it had significant association(24). Prevalence among distance time less than 30min had higher prevalence. This could be because of proximity of their home and therefore, there will be frequent water contact.

The prevalence of the infection was high among children who don't know whether the parasite penetrate skin to transmit the infection and the vector that transmit. This could be because they lack such knowledge; so that they might stay in the water without any fear of the infection and care of themselves for long period of time. However, the association between these variables and the infection was not significant.

Even though, 44.2% the children heard about urinary schistosomiasis from school, the school directors responded that there was no regular health education regarding the infection at the study area.

There was a statistically significant association (p=0.03) between living with parent and urinary schistosomiasis infection. Children who were not living with their parent were three times more likely affected with the infection [AOR=3.09; (95%CI: 1.14, 8.40)] than those that live with their parent. That

is in line with study conducted in Nigeria(31). This could be because children who didn't live with their parent lack person who will tell them the risk of repeated contact with stagnant water and therefore, they might pass most of their time in swimming and playing in the water for long period of time.

The prevalence of under-nutrition (stunting, underweight and thinness) was less than that of study done in Nigeria (26). This could be because the intensity of the infection was higher than the intensity recorded in this study. Logistic regression analysis of under-nutritionand urinary schistosomiasis infected children showed no significant association between the two variables which was similar withstudy conducted in Nigeria(26)and Ghana (27).

8. CONCLUSION

According to this finding, the prevalence of urinary schistosomiasis among Abobo district primary school children was moderate; therefore, urinary schistosomiasis was endemic at the current study site.There was low prevalence of urinary schistosomiasis related under-nutritionand no significant association between them. Factors like sex, father's occupation and living with biological parents' were significantly associated with urinary schistosomiasis.

9. RECOMMENDATION

Children should avoid swimming, washing and playing in dam. Health educations need to be given for school children by the district health office to equip them with the basic information about urinary schistosomiasis helpful for its control and prevention. While urinary schistosomiasis prevention and control activities are undertaken, special attention should be given to male children, children whose father is farmer and children who don't live with their parent. Regional health and education bureau should collaborate together towards the reduction of the prevalence of urinary schistosomiasis at this district. Regular administration of Praziquantel should be carried out for the school children as per the WHO recommendations. Because integrated control of the disease is required, the district administrative should provide safe and sufficient water supply that will reduce the frequency of open water contact. Malacological survey (snail survey) is needed at the site, where this is a preliminary activity for the elimination of snailsto reducetransmission of this disease. Further researchs should be carried out on the general community to observe the distribution of the disease and to undertake interventional activity. Cohort study is needed to determine causal relationship between urinary schistosomiasis and under-nutrition.

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11. ANNEXES

Annex-I. Information sheet and Assent form

Title: **Prevalenceof** u**rinary schistosomiasis and related under-nutritionamong primary school children atAbobo district, Gambella, Southwest Ethiopia.**

Name of Investigator: ShashieGeleta

Name of the Organization: Perbongo mender 5/6 and Abobo primary schools

1. **Introduction**: You are invited to participate as a study participant in a research conducted. Your participation is voluntarily. The research team includes principal investigator and data collector.
2. **Purpose: -** The main objective of the study is to collect information on urinary schistosomiasis and related under-nutritional status among school children. Results of this will be used for decision making and planning for intervention to fight against urinary schistosomiasis infection and under-nutrition.
3. **Procedure**: The study is school based cross sectional study, through using laboratory test, anthropometric measurements and interview with structured questionnaire. Permission was processed from University of Gondar and school from Abobo district.
4. **Risk and/ or discomfort**: There is no any risk or discomfort that you will face by participating in this research except dedication of time for responding the question and giving urine for laboratory examination. Any personal information registered in registration books will not be copied and transferred to other bodies. Every piece of information will be kept confidentially.
5. **Benefit**: Children will be benefited by participating in this research as it is an opportunity to them to diagnose from urinary schistosomiasis. There will be a benefit for the schools, Gambella Regional Health bureau and different stake holders who are working on prevention and control of urinary schistosomiasis and nutrition intervention in getting a base line data that will lead them to different intervention activities.
6. **Compensation for participation:** You will not receive any payment for your participation in this research study.
7. **Confidentiality of your information-** All information gathered from the study participant will remain confidential. Personal information will be treated confidentially and under no circumstances will it be transmitted to any person or organization. The results of this study will be evaluated and summarized, and a feedback of the results to the study participants will be given by principal investigator in a way that only the study participant will know his/her result.

8. **Voluntary participation -** Your participation in the study is absolutely voluntary; no one is obliged to take part. Refusal to participate will involve no penalty. Each study participant is free to withdraw assent and discontinue participation in this study at any time.
9. **Alternative option**: - If you are not interested in this study you can leave it and you can give in the main laboratory.
10. **Person to contact:** If you have any question you can contact the principal investigator and you may ask at any time you want.

    Principal investigator: ShashieGeleta

    Cell phone +251913344122

    E-mail:lelokena@gmail.com

Oral Assent form

Serial no---------- Name of school ---------- Code no ---------- Date----------

I the under agreed study participant has been well informed about the objective of the study entitled "**Urinary schistosomiasis and related under-nutrition among primary school children atAbobo district, Gambella, Southwest Ethiopia, 2014"**. I am also told that all the information obtained at any course of the study is to be kept confidential. Moreover I have also been well informed of my right to keep hold of, decline to cooperate and drop out of the study if I want and none of my actions will have any bearing at all on my overall health care.

I agreed voluntarily to provide the requested samples from me.

Consent of family or guardian

I_____ parent/guardian/attendant, after being fully informed about the purpose of this study, hereby gives my consent on the student's participation in this study. I understand that my child/ the student free to withdraw at any time without penalty or loss of benefits.

Signature of parent or guardian _____ date _____

Name and signature of investigator _____Date_____

Annex II Information sheet and Assent form in Agnua

<u>Luupmo en yaanguud: walkmngwalakweer.</u>

Ghn kw``ny b``tw:T`wOcwm/Schistosomiasis / man wøjootynthlaacmwøatherøkicaammi moo k`lgødtobwcgbormo en yi p``nyAbwb, Gamblaythakickurbuutpinymana en b``tccwckitharpiny.

Nyengngatkw``nc: CaacGltha

**Kanykw``noyie:**Perbngkiøt gr manathiinhmana en yi p``ny` Abwbo.

Bwdhk: Ngatmoyie met man k``no b``tg, ojfgo man nud b``tkw``nj man no tksc en. Ni jøkw``no beege ii; ngatkw``no, jøwøcoongluupkanyacielkijøwø rang kw``no.

**Gcnkw``nokipere:**Gdntjhckw``no man kipere, manaperelethaeni bee per nee luupdeegømo di coong ø b``tT`wOcwom/Schistosomiasis / man wøjootynthlaacmwøatherøkicaammi moo k`lgødtobwocgoor. Ni luupgøni jap gejoo man raanyt`wmanøgøkigø.

**Joorkw``no/coongluup:**kw``no man beeyekw``nomotgfckiperkanymoyiethiinh/ Cross sectional study/ yigoorniuutjthmoknydaslkigenibeegeyøgø; laac di raanglaabratr, b`rki peek mar nyilaaldarømøki pc moojieø no rømøkikw``n man. kiperkw``no man nee cakmanynyawxalo moo goorøtgoormaramanak`layie, Gøndør, kikw``cøtgoor mar Abwbmonyoooth øgøki man n`klønyjraki man kw``na.

**G4no pft/t`gsdhgrdhaanhøkikøør kw``nj man**: kikrkw``ns man bung moraacmolny man pscdhntu, n`kpathta man cjpucaae moo keer-gekiper nee pgbcmopnyuunkigø needwøgukilaac moo cpukiperlaabratr. Ni luupmongati man nøwøgrpinyyiwlmanadwøngnibac`ngløøyjthweelimøøk.Ni luupibwatnabjatgenookanøkijiymøøk.

Køny mare: obwrmowøjoott`wocwmdsgtge, gejstgki gum djcl man kønygenijaakkiwatni bung jammimo cool ge. Kunynythwøødmnrøtgscrkibafrø mar joftdgcl mar athaanhpaacmanadwøngkijiymøøkmowøtwao b‘‘tt‘wocwomkit‘wcaammi, ni jap kijoo man o’ jøøgø nee cwpgekikønyb``tt`w man gø

**G4n jootkikøørkw``no:** kw``no man gøøctwgcka met ec, bee per nee ng`cu man n`k bung gcn da cooløjhjuyaanguudkipermanøcpudhntu.

Gwøkluup: luup moo coongbhst bung ngatmørmoløny man caanluupjgøjbrwalabrmør. Ni kwaantietluupgødøcnicbpinynakargeniduungatakw``n b``tuniduubangunicaantietluupgøjjøøakw``n b``t-geki joomo beer ningatti man nøning`cdajgr.

Nut b``tkw``nki met ec: nut marub``t kw``no man beeyeki met ecmaru,bungngatmo di kiteek, ni bung gcnmo di kikanyun`kmo nu kweerkikw``n man, lønyjrki man ngøligøkanyumanynyigøyiejaak.

Jwcr: n`k ii ba met ki man cwpwkiløkpedc, lønyjwrw man rangilaacmooi

Ngatpeenynyi: n`kpwacdagøjwwu, løny man peenynyungatakw``no, caamanomanynyugøyiejaak.

Nyengngatkw``no: CaacaGalatha

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<u>Luupmo p``ngkanyopoodenikw``nopootk`rcaaø/Nyilaar-goor /</u>

Kw``no------- Nyengøtgoor ----------Koot ------- Dw``y---------

A ninyengngaogooropinyenø, ngatk``nob``ta, tier kw``nomanotwwc b``tt`wocwommanøjootywthlaac moa therøkicaammi moa n`klønyki man k`lgødaatobworamowøgoodopiraaymeeri moa en yi p``nynyAbwobo, Gambeela, kurp`nhc`ng, Ithoopia, kikw``n2014 dhoo- oroopa. Acaanjwrathwøøki man n`kluupmo cur wøkkidhaa, ki man n`kbaløny man c`gwcaannøjwdhaanhømørjaak. Ni caanithwøøki man n`klønyjwraki man pwwayaanguunkw``no, ki man kweerawalaki man ngølagøjaakkanyømanynyagøyie ,nimanøjierarøkmwøgø bung gwnwiilerijootdeelmara.

Aanojwey man løøaluup moo peenyaanikige……

<u>Luupmo p``ngkanyopoodenikw``nopootk`rcaaø/Jøøapoothwalanywølnyilaar-goor /</u>

Cwwdwmara ----------, ngatapghdho/nyoodo, kikøørmana can tier kw``nojwra, yiamet man o nyilaalimara nee kw``nob``ta, ning``gø man n`klønyjwrajaak man weckw``nomanøgøkanyon`kmoeemanynyøyie, ni bung gwnjoodewalamoditwwoeni.

Nyengngata kw’ ---------- Dw``y----------

Nyengngatakw``no ---------- Dw``y----------

Annex-III Data collection tools

Structured questionnaire for assessment of prevalence of urinary schistosomiasis and related under-nutrition among primary school children at Abobo district, Gambella, Southwest Ethiopia, 2014.

I. Record of students school

1. Code number of the student _____
2. Grade _____
3. School name _____

II. Socio demographic characteristics

4. Age _____
5. Sex Male ☐ Female ☐
6. Address Abobo town ☐ Mender 17 ☐
7. What is your father's occupation?
   1. Farmer ☐
   2. Other
8. What is your mother's occupation?
   1. House wife
   2. Government employee ……..
   3. Daily laborer
   4. Other _____
9. What is the educational status of your father?
   1. Doesn't read and write
   2. Able to read and write
   3. Secondary school completed
   4. Expert level
10. What is the educational status of your mother?
    1. Doesn't read and write
    2. Able to read and write
    3. Secondary school completed
    4. Expert level

III. Associated factors for urinary schistosomiasis

1. Do you use latrine?
   1. Yes ☐ 2. No ☐
2. If no to No 1, where do you urinate and dispose the urine?
   1. Near the river ☐ 2. By Using pits dispose to the river ☐
   3. Open filled ☐

3. Where do you bath and wash clothes?

1. Alwero dam2. Other ☐

4. Do you swim in river?

1. Yes ☐ 2. No ☐

5. If yes to no 4, how often you swim to the river?

1. Sometimes ☐ 2. Regularly ☐

6. Do you live with your biological parents?

1. Yes 2. No

7. How long did it take from your residence to the dam (in minutes)?

1. <30 min 2. ≥30 min

8. Is their regular health education program in the school? (This is for school director)

1. Yes ☐ 2. No ☐

Urinary schistosomiasis knowledge questions

1. Have you ever heard about urinary schistosomiasis?

i. Yes, ii. No

2. If yes, what is the source of the information?

i. School iii. Others

ii.Home

3. What are the symptoms of urinary schistosomiasis?

i. Abdominal pain iv. Weakness

ii.Dysuria v. Don't know

iii. Bloody urine

4. What is the mode of transmission?

i. Swimming in infested water Iv.Playing in infested water

ii.Drinking dirty water v.Don't know

iii.Shaking hands

5. Do you know the parasite penetrates your skin in the water?

i. Yes ii. No

6. Do you know the vector?

   i. Yes ii. No

7. Is it possible to prevent urinary schistosomiasis?

   i. Yes iii. Don't know

   ii. No

8. Does urinary schistosomiasis have a treatment?

   i. Yes iii. Don't know

   ii. No

9. What are the prevention and control measures for urinary schistosomiasis?

   i. Avoid bathing in stagnant water
   ii. Use of Treatment
   iii. Appropriate Use of toilets
   iv. Provision of safe tap water
   v. Health education
   vi. Drinking clean water
   vii. Reduce water contact
   viii. Sanitation Killing snails
   ix. Don't know

IV. Anthropometricmeasures

1. Weight _____
2. Height _____

Annex –IV Laboratory data collection form

1. Code no_____

2. Age _____ Sex _____ Date_____

3. *S. haematobium* Positive ☐ Number of eggs per 10ml urine _____

   Negative ☐

Comments

Name of principal investigator _____

Signature _____ Date_____

Annex –V Materials and reagents used in the study

- Microscope slide
- Forceps

- Syringe, plastic, 10ml
- Nylon mesh filter, 12µm pore size and 13mm diameter
- Soft tissue
- Urine cup, for urine collection
- 37% Formalin
- 5% Bleach
- Pencil or marker for labeling
- Microscope

Annex- VI. Procedure for filtration technique

1. Place a nylon filter in the filter holder.
2. Agitate the urine sample by shaking it gently or by filling and emptying the syringe twice
3. Draw 10ml of the urine into the syringe and attach the filter holder to the bottom of the syringe.
4. Expel the urine from the syringe into the filter holder over a sink.
5. Carefully unscrew the filter holder, draw air into the syringe, reattach the syringe to the holder, and expel the air.
6. Unscrew the filter holder, remove the filter with the forceps and place it on a microscope slide.
7. Examine the whole filter under the microscope immediately at low power objective (10x).

ANNEX VII. Questioner in Agnua

Gïrpïëc

Gïrpïëckiperrangtäw mar ‘schistosomiasis’ mananäk mar laackilïng cam yidëëlyaakiicObwöcgöör mar **Ogatgöörmanadikwøng**moAbööbööpëërbööngooMënder 5/6,Gambëëla,Kanyopäthcängngiyiekilthoopiea.

III. Yi lïngøt-göör mar nyilaarøt-göör

1. Nyengnyilaarøt-göör _____

1. øtø_____
2. kööt mar nyilaarøt-göör _____
3. Nyengøt-göör _____

IV. Jap dwätökiöönymaalkijammi moa näkgutadhaanhømojiymopëënynyï

4. Cwiiri_____
5. Dhak/CwøwDicwøøI☐gø ☐
6. KarbëëtöDïïaAbwöböMänd☐ ☐
7. Tïïcmari
3. Ngatpuur ☐
4. Ngatnyigadha ☐
5. Ngattïïaakwöma ☐
6. Tïïëmo bat ☐
7. Ngatgath rec ☐
8. Mør(caani) _____
9. **Lïngøt-göörmariamane**

1. **Kwäänökigöörbaløny**
2. **Kwäänökigöörløny**
3. **RietOgatgööreethöörö**
4. Göörmanadwøng

V. Rømdëërdhaanhø

3. Peek mar dhaanhø
4. Bär mar dhaanhø

VI. Jammi moa näkgääbökitäw mar ‘schistosomiasis’ mananäk mar laac

1. Pïïmomaath ,kimothaalkimopiny kali kikaa?

1. Kälanaam ☐ Kälayiiith ☐

3. Kälaripï-böömma ☐ 4. Mør(caani) _____

2. Dëërikønyikønyøkiøt-laac?

1. Kare ☐ 2. Pathakare ☐

3.Ripïëc 2 näkmoløkpïëc bee pathakare, jøwlaacgikaakilaac moa therøkëëlki moa døøngngøthøw?

1. Deng naam ☐ 2. Øt-laacmoenadengnaam ☐

3. Wøkjaak ☐

4. Yi kwäängöyinaam?

1. Kare ☐ 2. Pathakare ☐

Gwnng`cjiykipert`wOcwom/Schistosomiasis/ manøjootywthlaacmwøatherø

a. Da gwwmo ii wnynykiperkipert`wOcwm /Schistosomiasis/manojootywthlaacmwøatherø?

i. Dagø
ii. ii. Bung-gø

b. N`kdagø, ii wwnynyokaa?

i. øt-goor
ii. Paac/ya- tut
iii. iii. Ywthjapc``no/g``bo- teeng -Talabwjwn, Ridieø…..
iv. iv.Møøk(caani)

c. Nyuuthmot`wOcwom/ Schistosomiasis / manøjootywthlaacmwøatherø?

i. R``mpinyec
ii. R``mkanyon`kmodhaanhølaac
iii. Laacmorege da remø
iv. iv.Laacmowøkninøkdøc
v. v.Kuwa

d. Uut j42thth2 moo mw62kige?

i. kwaang y4th p44mot`wmanøgødagøyie
ii. Maathpmobatøng
iii. M``thceng
iv. iv. Kw``ky4th p44mot`wmanøgødagøyie
v. v.Kuwa

e. Da twong4mongacci moo dønyyideerikirikwotdaalmari, kanyaeniyinaam?

i. dagø
ii. ii. bung-gø

f. Gwnk`lgøng`yw?

i. Ng``a
ii. Kwua

g. Lønyki man m`nt`wOcwom/Schistosomiasis / man wøjootywthlaacmwøatherø?

i. Løny
ii. Baløny
iii. Kwua

h. T`wOcwom/Schistosomiasis / man wøjootywthlaacmwøatherøKnmoedagø?

i. Dagø
ii. Bung-gø
iii. Kuwa

i. T`wOcwom/Schistosomiasis / man wøjootywthlaacmwøatherøM`nbnidwa?

i. Man balwøøyothpmobakwd/ocug?
ii. Man kønydwalknhn
iii. Man kønydwsdlkiøtlaacnakarge
iv. Man tnhcphnmoboomba/tøngnadagø
v. Man cjpmkipwocmoguttjootdaal
vi. Man m`dhokipnmmotøng
vii. Man dwøkkønydaalpinykipwlmoreyø
viii. Man thbcpinynatøng; kin`kocwom
ix. Kuwa